

ROBOFEST 2026

Technical Specifications

Open Category – Autonomous Drone Competition



Organized by:
Faculty of Engineering
Sri Lanka Institute of Information Technology
Malabe, Sri Lanka

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1. INTRODUCTION

1.1. SOAR. SENSE. SUCCEED.

The Autonomous Drone Challenge at ROBOFEST 2026 pushes the limits of aerial intelligence. In a dynamic outdoor arena, your drone must think on its own, navigating through multiple landing zones, detecting visual markers, avoiding obstacles, and racing the clock. It's not just about speed; it's about adaptability, precision, and mastery of autonomous systems. The skies await for those bold enough to command them.

1.2. About the ROBOFEST Open Category Autonomous Drone Competition

ROBOFEST is an annual robotics competition organized by the Faculty of Engineering, Sri Lanka Institute of Information Technology (SLIIT), where competitors showcase their technical aptitude, imagination, and innovation through designing, building, and competing with their very own robots.

Building upon the success of the previous year, **ROBOFEST 2026 Open Category** continues the **Autonomous Drone Challenge** with enhanced competition standards, refined technical requirements, and an even more demanding autonomous mission environment. In this challenge, teams are required to design, assemble, and program a fully autonomous drone in accordance with the technical specifications outlined in this document. Detailed descriptions of the assigned task, the features of the flying arena, mission objectives, and additional relevant information are also provided. Based on these guidelines, a panel of impartial judges will evaluate the competing teams, and the top-performing teams will be awarded valuable prizes.

1.3. The Autonomous Drone Challenge

The objective of this contest is to design, assemble, and program an autonomous drone capable of exhibiting adaptive intelligence to autonomously navigate through multi-stop waypoints within the flying arena in the shortest possible time.

1.4. Important Dates

Deadline for registrations	: 31st July 2026
Preliminary rounds	: 28th September 2026
Final competition	: 28th September 2026

2. THE COMPETITION

2.1. Contest Eligibility

2.1.1. Team

- Each team should be a minimum of 2 people and maximum of 5 people.
- Since this is the open category, there is no limitation with regards to age or educational level.
- Prior approval for the drone should be obtained by the civil aviation authority at least two weeks before the competition.

2.1.2. Registration

- All entrants to the contest must register their teams before the deadline for applications on the **31st of July 2026**.
- Each team should register a unique name under which the members would be registered.
- If there are 2 or more teams with the same name, the name will be allocated on a first-come, first-served basis.
- Event organizers may reject a team name during registration if it is deemed inappropriate, and the team would be informed to submit a different name.
- Event organizers may reject the team registration if the team doesn't have the necessary approval from the Civil Aviation Authority.

2.1.3. Regulatory Approval

- Each team leader needs to get the approval for their Drone from Civil aviation authority by submitting the completed registration form with other necessary documents.
 - If an off-the-shelf drone is being used as an autonomous drone, then form No: CAA/OP/074 needs to be filled (<https://www.caa.lk/en/drones?id=438>) along with other necessary documents.
 - If the drone is built using parts/kits etc. then form No: CAA/OP/076 needs to be filled (<https://www.caa.lk/en/drones#privately-build-drones>).
- Each team needs to get the approval well in advance and it is the responsibility of the team to get the necessary approval before the competition date.
- Teams without the necessary approval will not be allowed to participate in the competition.
- Each team should obtain the approval at least one week prior to the competition date and send a copy of the approval document to the organizers well in advance.

2.2. The Drone Challenge Task

2.2.1. Mission Overview

- Each team must deploy their autonomous drone to complete a navigation and landing task within the designated arena.
- The mission begins at the designated Starting Zone, and concludes at the Finishing Zone, located at the diagonally opposite corners of the arena.
- Along the path, the drone must touch-and-go off from a series of intermediate Landing Islands in a specific order while avoiding obstacles, before performing a final landing at the Finishing Zone.

2.2.2. Arena Description

- The competition will be held in an outdoor open-area arena encompassing two standard tennis

courts placed side by side.

- Figure 1 in the appendix is an image of the arena taken from above.
- The surface is cement-based, with ambient natural lighting and possible wind disturbances.
- There will be landing islands and obstacles in the flying arena.

2.2.3. Landing Islands

- Between the start and end zones, there will be several white-colored landing platforms, referred to as "Landing Islands".
- Each landing island is a square box of 70 cm × 70 cm x 50cm (height), marked clearly on the court.
- The top surface of each island displays a black capital English letter, oriented parallel to one edge of the square for consistency and readability.

2.2.4. Start Zone and End Zone

- Similar to landing islands, these two are square boxes of 150cm x 150cm x 50cm (height).
- The start zone box is green colored, and the end zone is blue colored.

2.2.5. Task Requirements

- The drone must:
 - Take off from the Starting Zone.
 - Touch-and-go on every island, in alphabetic order.
 - Finally land at the Finishing Zone.
- The drone must autonomously detect and avoid obstacles in the arena.
 - Four obstacles on the arena.
- The drone should avoid navigating outside of the arena.

2.2.6. Main Rules

- The team that completes the task **without penalties** in the shortest time (from takeoff at Start Zone to final landing at Finish Zone) will be ranked highest.
- Incomplete missions or missed landings will result in adding penalty scores.
- Teams with the highest score will win in case there are no teams that complete the task fully.
- Each team will be given a fixed number of attempts (**exact number** specified on competition day) with a time cap for each run (**exact time** specified on competition day).
- The highest score across all valid attempts will be considered for final ranking.

2.3. Specifications of the Drone

2.3.1. Flight Autonomy

- All drones must operate fully autonomously once the flight begins. This includes:
 - Autonomous takeoffs, waypoint navigation, and landings.
 - Obstacle detection and avoidance.
 - Avoid going outside the flying arena and avoid going above the flight ceiling.
- Manual intervention is allowed only before the very first takeoff and after finishing landing. Any manual control during flight will result in disqualification.
- An exception is made for the fail-safe system which doesn't necessarily have to be an autonomous system.
 - This needs to be informed prior to the competition **starts**.

2.3.2. Permitted Communication

- Offboard processing (e.g., via a ground station/laptop) is not permitted and onboard processing is a must.
 - An exception can be made regarding the fail-safe system, but this should be informed

prior to the competition starts.

- No real-time control instructions can be sent from the ground station during the flight.
- Drones must be capable of completing the mission independently if the communication link is lost.
- Outside communication and manual control of the drone as a failsafe mechanism is permitted.
 - This needs to be informed prior to the competition starts.
- Judges may inspect the system to verify the declared autonomy level.

2.3.3. Size and Weight Constraints

- The drone must fit within a circle with a diameter size of 80 cm.
- Total weight, including battery, must not exceed 2 kg.
- Drones must not have any sharp, protruding, or hazardous elements.
- If any parts of the drone are replaced during the competition, the drone should be weighed again.

2.3.4. Navigation Systems

- Drones may use any combination of the following for autonomous navigation (but not limited to):
 - Visual odometry, SLAM, or marker-based systems for navigation.
 - Barometer, magnetometer, IMU for state estimation.
- GPS can be used for navigation, state estimation and position holding.
 - GPS can be used for navigation but there will be higher weight in score equation for those who use non-GPS approaches (ex: visual odometry) since they are much harder to implement.
 - GPS use for position holding doesn't result in any penalty.
 - GPS/GNSS can be used for failsafe system without any limitations.

2.3.5. Onboard Sensors

Permitted sensors include (but are not limited to):

- Cameras (RGB, stereo, depth)
- LIDAR or ultrasonic range finders
- Inertial Measurement Units (IMU)
- Barometer, magnetometer
- Optical flow sensors
- IR sensors, Ultrasonic sensors, Time-of-Flight sensors
- GPS/GNSS

2.3.6. Airframe Requirements

- Only rotary-wing drones are permitted in this competition.
 - This includes: Quadcopters, hexacopters, tricopters, or other multirotor configurations where lift and thrust are generated solely by rotating propellers.
- The use of fixed-wing drones, tilt-rotor, VTOL (Vertical Take-Off and Landing) hybrid systems, or plane-like airframes is strictly prohibited.
- All flight operations must be conducted within a hover-capable flight envelope, i.e., the drone must be able to take off, hover, and land vertically in place.

2.3.7. Power Source and Electrical Safety

- Power must be supplied by electric batteries only (e.g., LiPo, Li-Ion).
- Voltage between any two points in the circuit must not exceed 24V.
- All wiring must be properly insulated and secured.
- Teams must demonstrate safe battery handling practices and bring their own charging equipment. Charging is allowed only in designated areas outside the flying arena.
- Combustion-based power sources are strictly prohibited.

2.3.8. Safety and Fail-safes

- The drone must be equipped with a failsafe mechanism to:
 - Land immediately or return to base (**i.e., starting point**) on loss of signal
 - Avoid runaway situations
 - Avoid going beyond the buffer zones.
- Propellers must be enclosed or guarded.
- Teams may be disqualified for unsafe operation or risk to other teams, equipment, or personnel.
 - Teams should take into consideration the high-voltage lines beyond Buffer Zone 3 and vehicles and pedestrians beyond Buffer Zone 4.

2.4. Specifications of the Flight Area

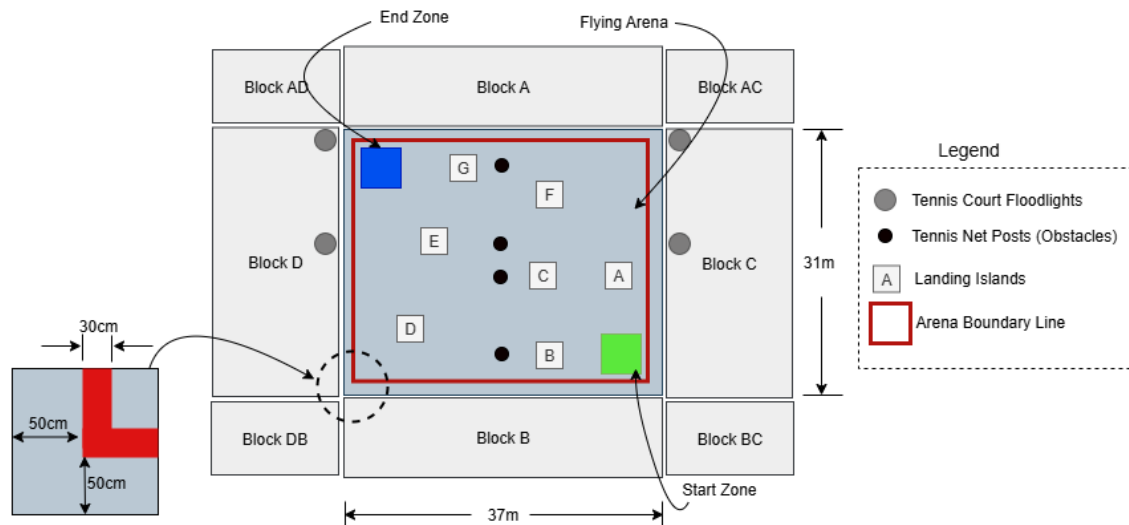


Figure 1: Layout of the flight arena and surrounding zones.

(Note: The placement of Landing Islands and Start/Finish Zones shown here is indicative and may not reflect their exact locations during the actual competition.)

2.4.1. Arena Layout and Dimensions

- The arena consists of two standard tennis courts placed side by side.
- The total area approximates 37 m (length) × 31 m (width) × 5m (height to ceiling).
- The arena has a cement floor and is exposed to natural lighting and weather.
- There is not a physical ceiling but there may be obstacles above 5m height from the floor.
- Figure 1 describes the flying arena and the surroundings.
- The Arena contains obstacles (i.e., net posts) and immediately outside the arena, there are four floodlights (height around 15m and diameter around 30cm).
- The boundary of the flight arena will be denoted by red colored lines of width 30cm.
- Appendix contains images taken of the arena (Figure 2 – 11).

2.4.2. Flight Zones

- The Start Zone and End Zone are located diagonally opposite corners.
- Multiple Landing Islands (150 cm × 150 cm × 50 cm height) are positioned between them.
- Start Zone is green colored, and End Zone is blue colored.

2.4.3. Obstacles

- There are four tennis net posts on the arena that act as obstacles and the participants need to detect and avoid these.
- Obstacles measure up to 115cm in height and 12cm in diameter.

- Appendix contains images taken of these obstacles (Figure 12 – 17).

2.4.4. Takeoff and Landing Zones

- Takeoff must occur from the designated Starting Zone.
- Landing must occur on each landing island and finally at the Finishing Zone.
- Drones may perform touch-and-go or **complete landing and a takeoff**, as long as each island is visited.

2.4.5. Visual and Environmental Conditions

- Lighting conditions may vary throughout the day; no assumptions should be made about illumination.
- Wind conditions may vary throughout the day; no assumptions should be made about the direction or the intensity of the wind.

2.4.6. Flight Boundaries

- All operations must occur within the designated arena boundary.
- Flying **beyond** the buffer zones will result in immediate disqualification.
- Flying **into** buffer zones should be avoided.
 - A penalty will be applied for each instance where the drone enters a buffer zone. A maximum of three (3) such infractions will be permitted.
 - A fourth incursion into any buffer zone will lead to the immediate termination of the flight attempt.
 - Persistent or repeated violations may result in disqualification at the discretion of the judging panel.

2.4.7. Buffer Zones

- As the arena is not fully enclosed, the surrounding areas are designated as buffer zones to ensure safety and avoid interference with external hazards.
- The buffer zones are illustrated in Figure 3 in the appendix.
- Buffer Zone 1 should be avoided as it may contain members of the audience.
- Buffer Zone 2 should be avoided due to the potential presence of vehicles and spectators.
- Buffer Zone 3 must be strictly avoided as it borders high-voltage power lines and a transformer, posing significant electrical hazards.
- Buffer Zone 4 must be avoided since it borders New Kandy Road (i.e., main road), with frequent pedestrian and vehicular traffic.
- Buffer Zone 5 should be avoided due to the presence of large trees, as well as pedestrians and vehicles beyond the zone.

2.4.8. Flight Ceiling

- Height from the arena floor to the ceiling is 5m (approximately 16ft).
- There is no physical ceiling but there may be obstacles above this height.
- Moving above 5m will result in penalties at the discretion of the judging panel.
- Persistent or repeated movement above 5m may result in disqualification at the discretion of the judging panel.
- Moving beyond 30m (approximately 100ft) will result in immediate disqualification.

2.4.9. Safety Protocol

- The arena will be cleared of people during each drone's flight attempt.
- Referees may halt a run at any time if the drone exhibits unsafe or uncontrolled behavior.
- Drones without a demonstrated fail-safe mechanism will not be allowed into the flying arena.

2.5. Rules for the Elimination Rounds

2.5.1. Initial Inspection

- Each drone must undergo an inspection by the judging panel before being allowed to participate in the elimination round.
- The inspection will verify:
 - Compliance with size, weight limits and other rules.
 - Functionality of the Failsafe Mechanism.
 - Declaration of any manual control and/or communication with outside entities.
 - Visual verification of onboard sensors.
- Drones that fail the inspection will not be allowed to compete until the issues are rectified.

2.5.2. Drone Calibration and Software Changes

- Calibration of drones can be done inside the arena before the final arena configuration is completed.
- Time given for calibration will be decided by the judges during the competition.
- Software changes can also be made before the arena configuration is completed but this needs to be done with the approval of judges.

2.5.3. Flight Attempt Format

- Each team will be allocated a defined flight slot during which they may perform up to 5 official attempts.
- Only one drone may be flown at a time.
- Between attempts, teams are allowed to perform minor repairs, battery replacements, sensor recalibrations, and software adjustments, subject to prior approval from the judges.

2.5.4. Time Allocation

- Each team will be given a maximum of 40 minutes (T_{max}) for all attempts combined.
 - While 40min is the stated time, the exact time will be announced at the start of the competition.
 - Depending on the number of teams participating, judges may decide to decrease this time as well.
- Time will be measured from the drone's initial liftoff to final touchdown at the Finishing Zone.
- The best valid attempt within this time will be used for qualification.

2.5.5. Completion Criteria

- A run is considered complete when the drone:
 - Takes off from the Starting Zone.
 - Successfully lands on and takes off from each Landing Island in alphabetic order
 - Lands at the Finishing Zone.
 - Avoids all designated obstacles.
 - Avoid moving into buffer zones and moving above 5m ceiling.
- Skipped islands, minor collisions and incursions into buffer zones will result in penalties.
- Major collisions will result in invalidation of the run.
- Soft landings and hard landings on the arena floor (not the islands) will also result in penalties.
 - soft landings – controlled landing.
 - hard landings – hitting the floor potentially damaging the arena.

2.5.6. Disqualifications of Teams

- The team will be disqualified if:
 - Manual intervention occurs during flight

- The drone flies beyond the buffer zones or above 100ft
- The drone fails to operate autonomously as declared
- Unsafe or reckless operation is observed
- Continuous incursion into buffer zones (this will be at the discretion of the judging panel)
- Continuous movement above the flight ceiling (this will be at the discretion of the judging panel)
- Continuously landing/hitting on the arena floor (this will be at the discretion of the judging panel)

2.5.7. Penalties

- Time adjusted penalties carry different weights under the following conditions:
 - Missed landing island: each penalty carries 0.05 weight (w_l)
 - Obstacle contact: each penalty carries 0.1 weight (w_o)
 - Incomplete landing at Finishing Zone: penalty carries 0.15 weight (w_e)
 - Incursions into buffer zones: each penalty carries 0.25 weight (w_b)
 - Moving above the ceiling limit (5m): each penalty carries 0.1 weight (w_c)
 - Soft Landing on the arena floor: each penalty carries 0.01 weight (w_{sl})
 - Hard Landing on the arena floor: each penalty carries 0.15 weight (w_{hl})
- These penalties are added to the raw time for ranking purposes.

2.5.8. Ranking and Qualification

- Teams will be ranked based on task completion, navigation time (T_{nav}), and received penalties.
 - Navigation time is defined as the time it takes to start from the start zone to finally land at the end zone.
 - Navigation time is calculated even if missing island landings occur.
- Teams that complete the task (i.e., run) will be given a ranking based on the navigation time, where lower time means higher ranking.
- Teams that don't complete the task will be given a score and regardless of their navigation/completion time, they will be ranked below the teams that complete the task.
- The top-performing five (5) teams from the elimination round will advance to the final round, as determined by the number of available finalist slots.

2.5.9. Score Calculation

$$Score = \frac{n}{N \cdot T_{nav} \cdot (1 + \sum w_i p_i)}$$

$$w_i \in \{w_l, w_o, w_e, w_b, w_c, w_{sl}, w_{hl}\}$$

- In the above equation, n refers to the number of correctly landed islands.
 - If there are six islands then landing order is ABCDEF and if a participating team lands in the order of ACBD FE, then 'n' will be 2 since only A and D are correctly landed islands.
- N refers to the number of all islands on the flight arena.
- In the score equation, w_i refers to the i -type weight category and the p_i refers to the number of penalties occurred for the i -type weight category.
- If navigation is not complete (i.e., drone doesn't land at the end zone), then T_{max} used as the T_{nav} .
- This score is also called the penalty-adjusted score.

Any violation or incident not addressed in the technical specifications will be decided at the judge's discretion. Therefore, the judges' decision will be final in such scenarios.

2.6. Rules for the Final Round

2.6.1. Pre-Final Verification

- All drones qualifying for the final round will be subjected to a second inspection to ensure:
 - No unauthorized modifications were made after elimination rounds.
 - Safety mechanisms and declared autonomy level remain unchanged.
 - Battery and structural integrity are intact.
- Drones must be placed in an isolation zone post-inspection until their flight slot.

2.6.2. Competition Format

- The final round will follow the same task as in the elimination round:
 - Take off from the Starting Zone
 - Successfully lands on and takes off from each Landing Island in alphabetic order
 - Avoid obstacles
 - Land at the Finishing Zone
- There may be more islands than in the elimination round.
- Complexity of the placement of the islands may be higher.
- Each team will be given only one (1) official attempt in the final round.

2.6.3. Time Limits

- Each team will have a maximum of 40 minutes (T_{max}) to complete their attempt.
- Timing begins upon takeoff and ends when the drone lands at the Finishing Zone.
- Judges will keep official time and calculate the ranking.

2.6.4. Penalty System

- The same penalties apply as in the elimination round.
- If no team completes the task, final rankings will be entirely based on the score value.
 - Higher team wins and the same score equation will be used as in the elimination round.

2.6.5. Disqualifying Infractions

- The run will be invalidated if:
 - Manual intervention occurs during flight
 - The drone flies beyond the buffer zones or above 100ft
 - The drone fails to operate autonomously as declared
 - Unsafe or reckless operation is observed
 - Continuous incursion into buffer zones (this will be at the discretion of the judging panel)
 - Continuous movement above the flight ceiling (this will be at the discretion of the judging panel)

2.6.6. Tie-Breaking Rules

- In case of same ranking or score is given to more than one team, the judges will decide the ranking.

2.6.7. Awards and Final Results

- The award will be given to the team that completes the task (refer 2.5.5.) and ranks highest based on final rankings.

Any violation or incident not addressed in the technical specifications will be decided at the judge's discretion. Therefore, the judges' decision will be final in such scenarios.

Note: Registered teams are encouraged to check this specification document periodically, as it may be subject to minor revisions.

3. ADDITIONAL INFORMATION

Any amendments to the rules will be updated on the ROBOFEST website: www.robofest.lk Please do not hesitate to contact us if further information or clarification is required. You may contact the ROBOFEST organizers through email at robofest@slit.lk or contact the Open Category Coordinator.

Open Category Coordinator

Mr. Pulathisi Perera,
Faculty of Engineering,
SLIIT- Malabe Campus.
Phone number: 0766 154172
Email: pulathisi.p@slit.lk

Registration link: <https://forms.cloud.microsoft/r/PD9P69GrDw>



4. APPENDIX

Video Link: [Robofest Drone Track.MP4](#)

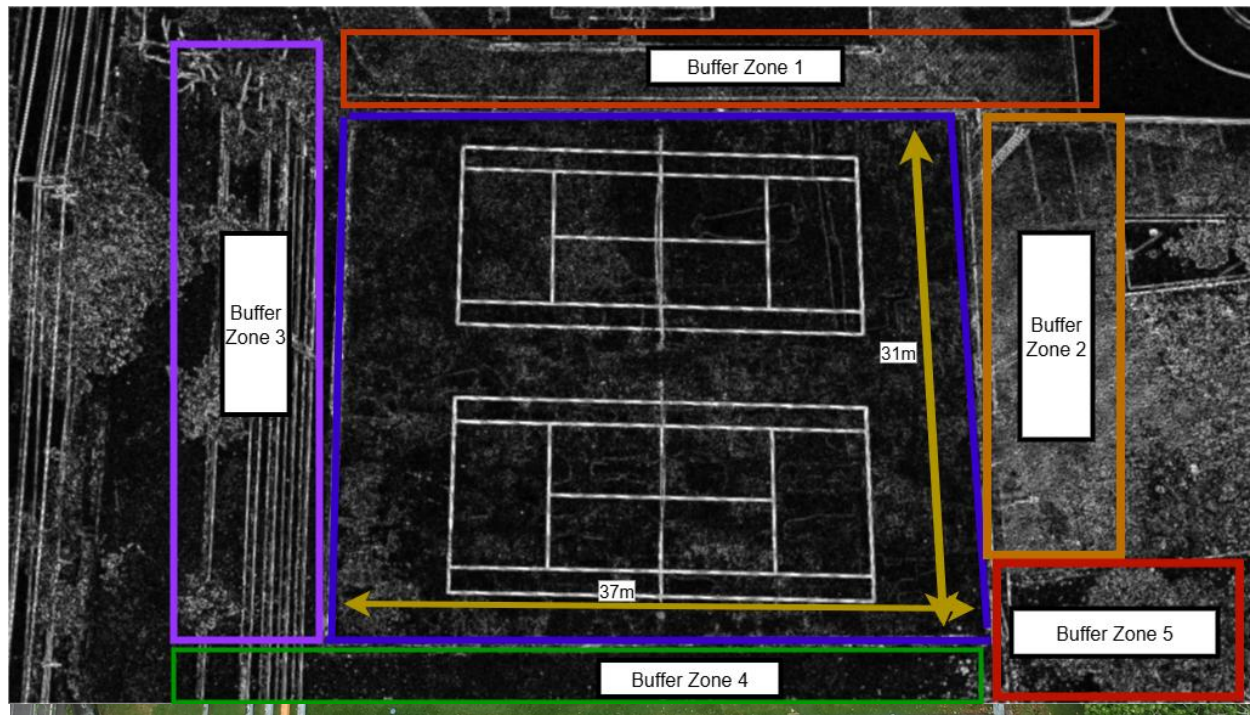


Figure 3: Buffer Zones around the Flying Arena



Figure 4: View of Block AC



Figure 5:View of Block C



Figure 6: View of Bock DB



Figure 7: View of Block BC



Figure 8: View of Block B



Figure 9: View of Block B and Block BC



Figure 10: View of Block A



Figure 11: View of Block A



Figure 12: Tennis Net Posts (Obstacles)



Figure 13: Tennis Net Posts (Obstacles)



Figure 14: Tennis Net Posts (Obstacles)



Figure 16: Tennis Net Post (Obstacles) Dimensions



Figure 15: Tennis Net Post (Obstacles) Dimensions



Figure 17: Tennis Net Post (Obstacles) Dimensions